Kramer Electronics, Ltd.

USER MANUAL

Model:

VS-162AVM

16x16 Audio-Video Router with Preview Monitor

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 11 groups[1] that are clearly defined by function.

Thank you for purchasing the **VS-162AVM** *16x16 Audio-Video Router with Preview Monitor* that is ideal for the following typical applications:

- Any professional system requiring outstanding value in a 16x16 matrix
- Production and duplication facilities
- Rental/staging applications, security, CCTV, and home theater systems

The package includes the following items:

- **VS-162AVM** *16x16 Audio-Video Router with Preview Monitor*
- Power cord[2] and rack "ears"
- Windows®-based Kramer control software
- This user manual[3]
- Kramer **RC-IR3** Infrared Remote Control Transmitter (including the required battery and a separate user manual)

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high-performance high-resolution cables[4]

1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Products

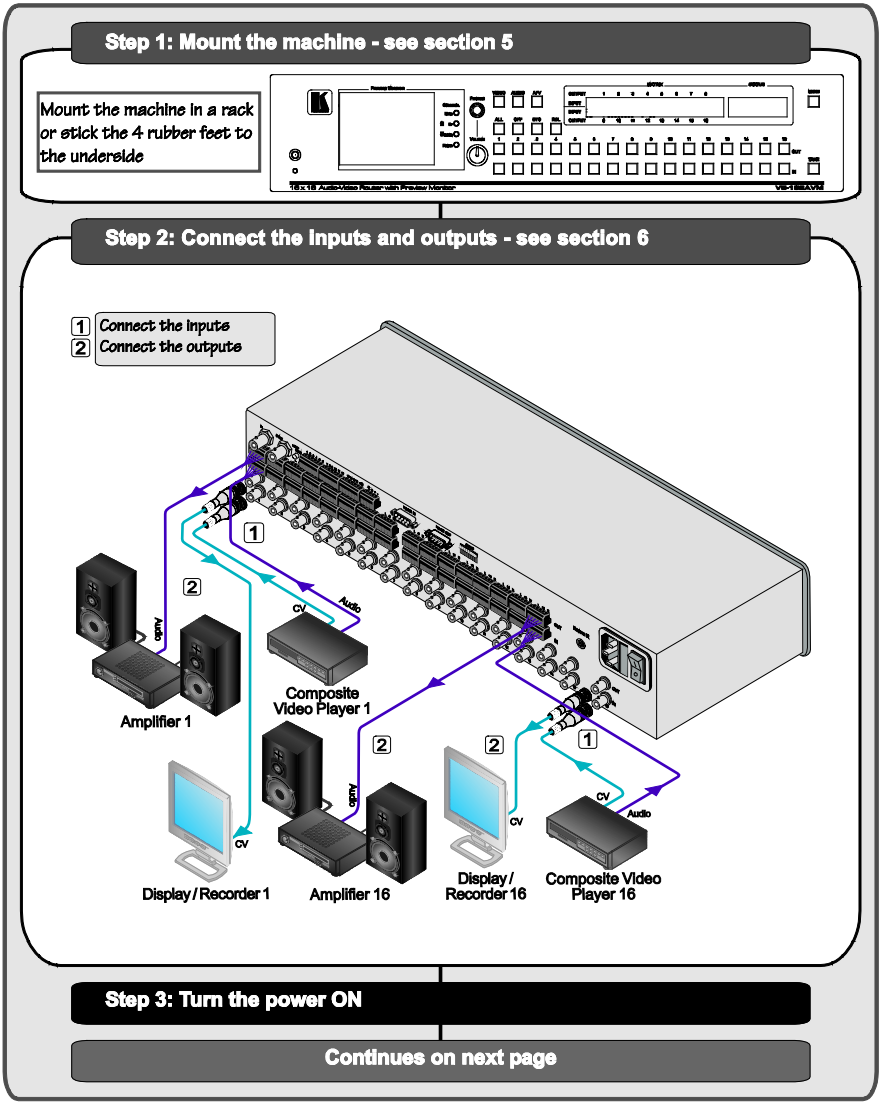
2 We recommend that you use only the power cord supplied with this device

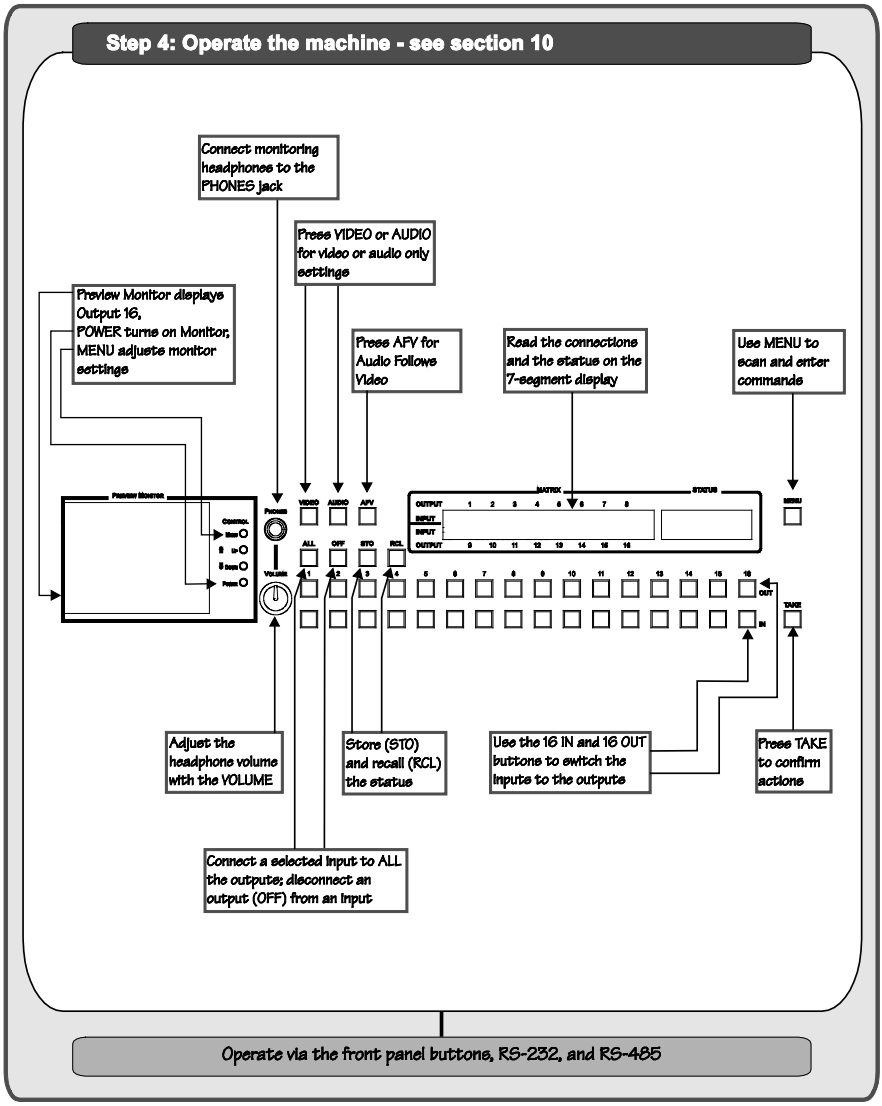
3 Download up-to-date Kramer user manuals from our Web site at http://www.kramerelectronics.com

4 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.


Step 1: Mount the machine - see section 5
Mount the machine in a rack or stick the 4 rubber feet to the underside
Step 2: Connect the inputs and outputs - see section 6
1 Connect the inputs
2 Connect the outputs
Amplifier 1
Composite Video Player 1
Display / Recorder 1
Amplifier 16
Display / Recorder 16
Composite Video Player 16
Step 3: Turn the power ON
Continues on next page


Step 4: Operate the machine - see section 10
Connect monitoring headphones to the PHONES jack
Press VIDEO or AUDIO for video or audio only settings
Preview Monitor displays Output 16, POWER turns on Monitor, MENU adjusts monitor settings
Press AFV for Audio Follows Video
Read the connections and the status on the 7-segment display
Use MENU to scan and enter commands
Adjust the headphone volume with the VOLUME
Store (STO) and recall (RCL) the status
Use the 16 IN and 16 OUT buttons to switch the inputs to the outputs
Press TAKE to confirm actions
Connect a selected input to ALL the outputs; disconnect an output (OFF) from an input
Operate via the front panel buttons, RS-232, and RS-485

3 Overview

The **VS-162AVM** is a high-performance 16x16 vertical interval matrix switcher for composite video signals on BNC connectors, and balanced stereo audio signals on detachable terminal block connectors.

The **VS-162AVM** forms part of the series of 16x16 matrix switchers that includes, but is not limited to, the **VS-1616A** (a 16x16 analog balanced stereo audio matrix switcher), and **VS-162V** (a 16x16 video matrix switcher).

In particular, the **VS-162AVM** features:

- A built-in high-quality 3.5-inch LCD display and audio headphone output with volume control to conveniently monitor the video and audio of any channel before and after switching
- Excellent video performance, which ensures that it remains transparent in almost any video application
- Broadcast-quality specifications for audio bandwidth and levels, and video bandwidth extends to well over 90MHz making the unit suitable for all video and audio applications
- Multiple SYNC options that make it appropriate for a wide range of applications with glitch-free transitions. It produces glitch-free transitions, when sources share a common reference sync[1]

In addition the **VS-162AVM**:

- Can be configured into a Kramer multi-signal switcher system including digital and analog video, digital and analog audio, and RS-422 control switchers
- When integrated in a system, all units switch in true audio-follow-video mode
- Both audio-follow-video and breakaway modes are available
- Recalls up to 60 configuration setups via the non-volatile memory and provides for an unlimited quantity of setups when using the Kramer control software on your PC
- Includes an alphameric LCD display to clearly view the switching status and operate the menus and setup
- With its FLASH memory, lets you upgrade to the latest Kramer firmware version via Internet download

1 As it switches during the vertical interval

The **VS-162AVM** can be controlled:

- Using the front panel buttons
- Remotely, by RS-485 or RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller
- Remotely, from the Kramer **RC-IR3** Infrared Remote Control Transmitter
- Via external contact closure push buttons

To achieve the best performance:

- Use only good quality connection cables[1] to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables).
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **VS-162AVM** away from moisture, excessive sunlight and dust

4 Your Audio-Video Router

Figure 1 illustrates the front and rear panels of the **VS-162AVM**. Table 1 and Table 2 define the front and rear panels of the unit.

1 Available from Kramer Electronics on our Web site at http://www.kramerelectronics.com

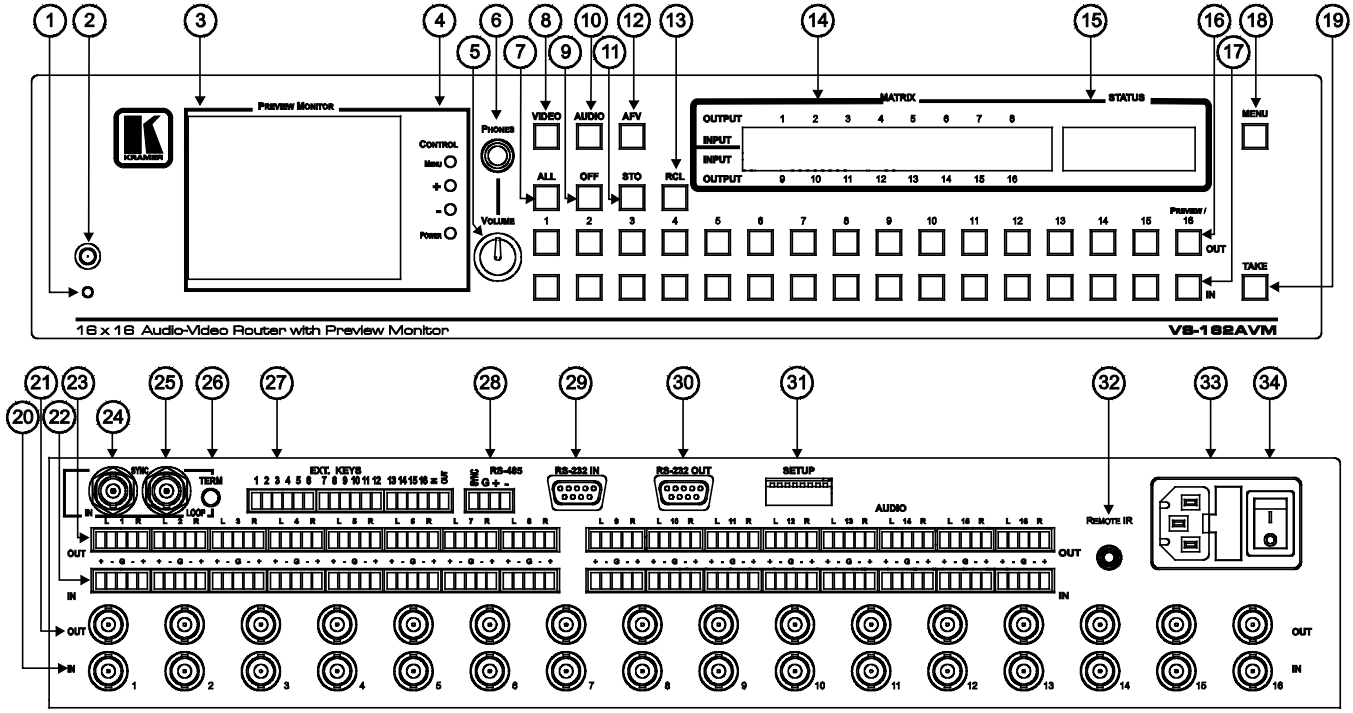


Figure 1: VS-162AVM 16x16 Audio-Video Router with Preview Monitor

Table 1: Front Panel Features

#	Feature		Function
1	IR Receiver LED		The red LED illuminates when receiving signals from the Kramer infrared remote control transmitter
2	IR Receiver		Receives signals from the Kramer infrared remote control transmitter
3	*Preview Monitor*		Displays the video routed to output 16
4	LCD *CONTROL*	*MENU* Button	Press once to display the last LCD settings (brightness, contrast, saturation, and sharpness), each additional press scrolls through the menu items
		+ Button	Increases the selected setting
		– Button	Decreases the last setting
		POWER Button	Turns the LCD display on and off
5	*VOLUME* Knob		Adjusts the audio level of the headphones
6	*PHONES* ¼" Connector		Jack for connecting the headphones to audio 16 output
7	*ALL* Button		Pressing *ALL* followed by an *INPUT* button, connects that input to all outputs
8	*VIDEO* Button		When selected[1] actions relate to video independently from audio
9	*OFF* Button		An *OFF-OUT* combination disconnects that output from the inputs; an *OFF-ALL* combination disconnects all the outputs
10	*AUDIO* Button		When selected [2] actions relate to audio independently from video
11	*STO* Button		Stores the current setting in the non-volatile memory
12	*AFV* Button		When selected actions relate to video and audio channels. Audio channels follow the video channels, and the AFV button is illuminated
13	*RCL* Button		Recalls a setup from the non-volatile memory
14	LCD *MATRIX* Display[3]		Displays the selected input(s) switched to the output(s) (above or below the corresponding *OUTPUT* label) and user interface messages
15	LCD *STATUS* Display[3]		Displays the matrix status
16	*OUT* Buttons		Select the output to which the input is switched (1 to 15) Preview/16 connects the input to the preview monitor
17	*IN* Buttons		Select the input to switch to the output (1 to 16)
18	*MENU* Button		Recall and navigate the menu points for matrix setting
19	*TAKE* Button		Used to confirm and complete setup and switching

Table 2: Rear Panel Features

#	Feature		Function
20	*IN* BNC Connectors		Connect to the video sources
21	*OUT* BNC Connectors		Connect to the video acceptors
22	*IN* Terminal Blocks		Connect to the audio sources
23	*OUT* Terminal Blocks		Connect to the audio acceptors
24	SYNC	*IN* BNC Connector	Connect to the external video sync source
25		*LOOP* BNC Connector	Connect to the *SYNC IN* connector on the next unit
26	*TERM* Button		Press to terminate at 75Ω or release for looping (push in to terminate the sync line. Release when the sync line extends to another unit)
27	*EXT.* (extension) *KEYS* Terminal Block Connectors		Connect to an external keyboard (remote unit)

1 The VIDEO button is illuminated when the video breakaway mode is selected

2 The AUDIO button is illuminated when the audio breakaway mode is selected

3 In sections 10 and 11, the word "Displays" refers to the LCD MATRIX and STATUS displays

#	Feature	Function
28	*RS-485* Detachable Terminal Block Port	PINS # 1 and # 2 are for vertical sync and Ground connection, and PINS # 3 and # 4 are for RS 485
29	*RS-232 IN* 9-pin D-sub (F) Port	Connect to the PC or the Remote Controller[1]
30	*RS-232 OUT* 9-pin D-sub (M) Port	Connect to the RS-232 IN 9-pin D-sub (F) port of the next unit in the daisy-chain connection
31	*SETUP* DIP-switches	DIP-switches for setup of the unit
32	*REMOTE IR* 3.5mm Mini Jack	Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)[2]
33	Power Connector with Fuse	AC connector enabling power supply to the unit
34	Power Switch	Illuminated switch supplying power to the unit

4.1 Using the IR Transmitter

You can use the **RC-IR3** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver[3]. The external IR receiver can be located 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables[4]

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable[5] with the 3.5mm connector that fits into the REMOTE IR opening on the rear panel. Connect the external IR receiver to the REMOTE IR 3.5mm connector.

1 If the unit is not the first unit in the line, connects to the RS-232 OUT 9-pin D-sub (F) port of the previous unit in the line

2 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the VS-162AVM (only if the internal IR connection cable has been installed) (See section 4.1)

3 Model: C-A35M/IRR-50

4 Model: C-A35M/A35F-50

5 P/N: 505-70434010-S

5 Installing the VS-162AVM in a Rack

This section provides instructions for rack mounting the unit.

Before Installing in a Rack

Before installing in a rack, be sure that the environment is within the recommended range:

Operating temperature range	+5º to +45º C (41º to 113º F)
Operating humidity range	10 to 90% RHL, non-condensing
Storage temperature range	-20º to +70º C (-4º to 158º F)
Storage humidity range	5 to 95% RHL, non-condensing

CAUTION!

When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.

2. Once rack mounted, enough air will still flow around the machine.

3. The machine is placed straight in the correct horizontal position.

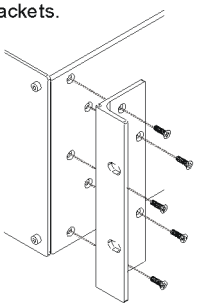
4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.

5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

How to Rack Mount

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (5 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note:

- In some models, the front panel may feature built-in rack ears
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions (you can download it from http://www.kramerelectronics.com

6 Installing and Operating a Single VS-162AVM

To install the **VS-162AVM**, connect the following[1] to the rear panel, as required:

- Video input and output cables
- Audio input and output cables
- Control interface cables between switcher units, or PC (or other controller), as section 9 describes
- Set the DIP-switches, as section 8.1 describes
- Power cord
- Set the system variables using the MENU function, as section 11 describes

By default, the **VS-162AVM** is setup for use as a single machine. This means that it is:

- A 16x16 composite video switcher and a 16x16 balanced stereo audio switcher are set to function by default, in the audio-follow-video mode
- Switched during the vertical interval of the external reference

In particular, be sure that the DIP-switches are set as Figure 2 illustrates (see section 8.1 for further details):

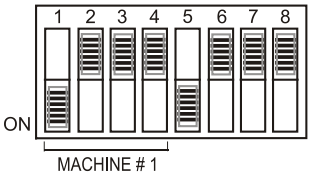


Figure 2: Default DIP-Switch Setup on a Single Machine

To operate a single machine, see Table 3.

1 Switch OFF the power on each device before connecting it to your unit

Table 3: Quick Reference Operating Guide for a Single Machine

To perform this command:	Press:
Set breakaway mode[1]	VIDEO
Set breakaway mode[2]	AUDIO
Set audio-follow-video mode[3]	AFV
Connect an input with an output	OUT #; IN #
Clear (disconnect) a specific output	OUT #; OFF
Clear (disconnect) all outputs	ALL; OFF
Connect all outputs to a specific input	ALL; IN #
Store a setup	STO; OUT #; TAKE
Recall a setup	RCL; OUT #; TAKE
Lock front panel	MENU; TAKE
Unlock front panel	TAKE; TAKE
Change default setup	Press the Menu button several times until you reach the appropriate Menu setup command and follow the instructions

7 Configuring the VS-162AVM

Using the **VS-162AVM** unit and/or other 16x16 matrix switchers in the series[4], you can assemble the following kinds of systems:

- A standalone switcher (see section 7.1)
- A system of interconnected switchers (see section 7.2)

Note: When configuring multiple units, each unit must have an address. For an explanation on addressing and system modes, see section 8.

7.1 Configuring a Standalone Switcher

By default, a single **VS-162AVM** unit is configured for:

- Composite video with 16 inputs and 16 outputs on BNC connectors, and
- Balanced stereo audio with 16 inputs and 16 outputs on detachable terminal block connectors, as shown in Figure 4 (to configure for unbalanced[5] stereo audio, see Figure 5 and Figure 6)

1 All operations and the LCD MATRIX display relate to the video channel (independently from audio)

2 All operations and the LCD MATRIX display relate to the audio channel (independently from video)

3 All operations and the LCD MATRIX display relate to both the video and the audio channels. Audio channels follow the video channels

4 Including the VS-1616A (a 16x16 analog balanced stereo audio matrix switcher)

5 However, for an unbalanced stereo audio input, the output is always half of the input signal. For example, if the input is 6dB, the output is 0dB

Configure your **VS-162AVM** unit as a standalone switcher, as Figure 3 illustrates:

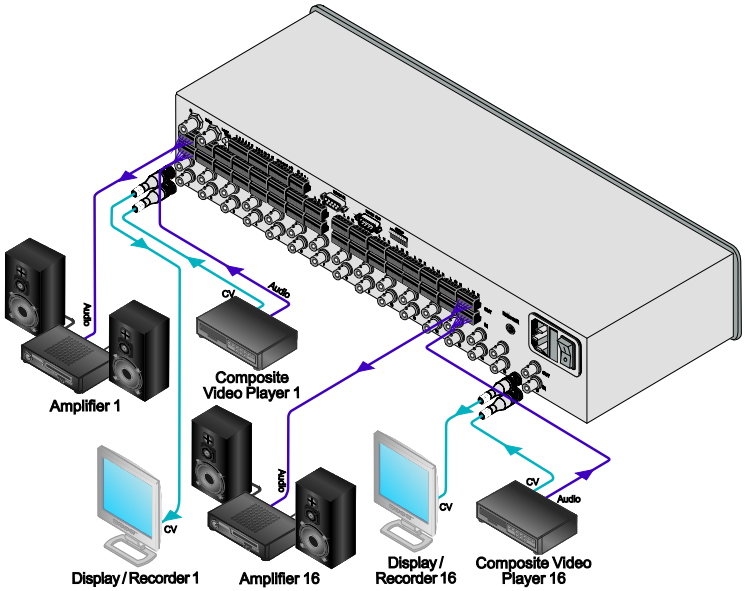


Figure 3: Configuring the VS-162AVM as a Standalone Switcher

7.2 Connecting the Balanced/Unbalanced Stereo Audio Input/Output

This section illustrates how to connect:

- A balanced stereo audio input/output connection, see Figure 4
- An unbalanced stereo audio input connection, see Figure 5
- An unbalanced stereo audio output connection, see Figure 6

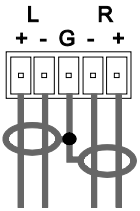


Figure 4: Connecting the Balanced Stereo Audio Input/Output

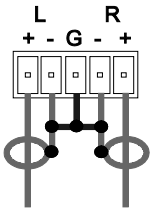


Figure 5: Connecting the Unbalanced Stereo Audio Input

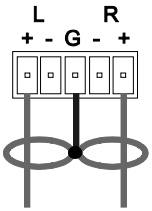


Figure 6: Connecting an Unbalanced Stereo Audio Output

7.3 Assembling a System of Interconnected Switchers

A major advantage of the **VS-162AVM** is that it belongs to the series of 16x16 matrix switchers and, as such, can interconnect with other switchers in the series. This series includes, but is not limited to, the **VS-1616A** (a 16x16 analog balanced stereo audio matrix switcher), and **VS-162V** (a 16x16 video matrix switcher).

The block diagram in Figure 7 illustrates how to assemble an interconnected varied-format 16x16 series switcher that consists of a *16x16 Audio-Video Router with Preview Monitor* (MACHINE # 1), a 16x16 digital video matrix switcher (MACHINE # 2), and a 16x16 digital audio matrix switcher (MACHINE # 3). Each switcher has a unique MACHINE #. Control of the system is via the MACHINE #.

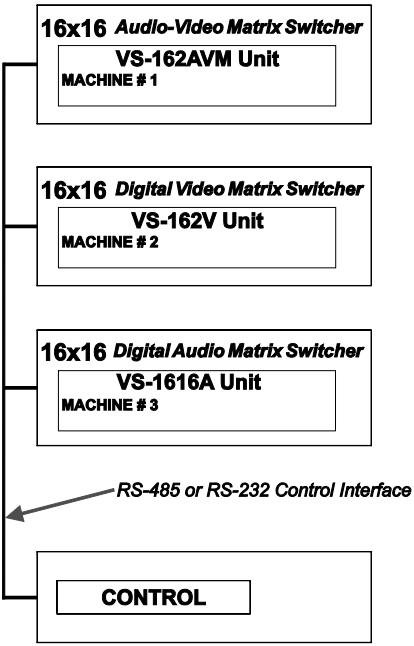


Figure 7: Assembling a System of Interconnected Switchers

See section 8.1 for how to set the DIP-switches, and section 9 for how to control this group of interconnected varied-format 16x16 series switchers, and other configurations.

8 Understanding Addressing and System Modes

To control multiple machines, the **VS-162AVM** uses a system of addressing that includes hardware DIP-switches and menu commands. The DIP-switches are used to set the MACHINE#, and menu commands are used to set the MACHINE ADDRESS #. Note the following:

- A standalone machine is always set to MACHINE# 1
- When configuring multiple **VS-162AVM** units or a matrix of **VS-162AVM** machines, the array is viewed as one large unit and the DIP-switches of all machines are set to the same MACHINE#. However, each machine is set to a unique MACHINE ADDRESS # with a menu command on its display panel according to the addressing rule shown in 8.1
- When configuring a mix of different model machines, each group of models receives a different MACHINE# and each machine is set to a unique MACHINE ADDRESS # (see section 8.2).

8.1 Setting the DIP-Switches

Configure the unit by setting the 8 DIP-switches as defined in Figure 8 and Table 4:

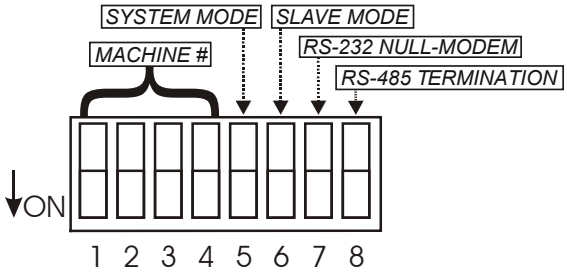


Figure 8: Rear Panel DIP-switches

Table 4: DIP-Switch Definitions

DIP-switch #	Function:
1-4	Set the MACHINE # (see Table 5 in section 8.2)
5	Enables (ON) or disables (OFF) the *Follow-SYSTEM* mode
6	Enables (ON) or disables (OFF) the *SLAVE* mode in a multi-channel configuration
7	Disables use of a null modem adapter[1] with RS-232 OFF = RS-232 connection via a null modem adapter ON = RS-232 connection without a null modem adapter
8	RS-485 termination for first and last machine = ON (RS-485 line terminates with 110Ω); for others = OFF (RS-485 line is open)

8.2 Setting the MACHINE

To control a unit via RS-232 or RS-485, each unit has to be identified via its unique MACHINE #. Set the MACHINE #[2] on a unit according to Table 5. A valid MACHINE # is from 1 to 15.

Table 5: Machine # DIP-switch Settings

MACHINE #	DIP-SWITCH			
	1	2	3	4
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

1 See section 9.1

2 When using a single unit, set the unit to MACHINE # 1

8.3 Understanding the SYSTEM Mode

The terms *audio-follow-video*[1] and *audio breakaway*[2] are well known. Sometimes signals other than audio signals need to switch simultaneously and at other times, need to switch independently. For example:

- Non-linear editing systems, that sometimes combine video with analog audio and at other times combine video with digital audio
- Duplication systems, that make Master tapes from programs with different formats: composite analog, component analog and component digital

DIP 5 defines whether the unit communicates with other switchers via a common control line.

You can set **DIP 5 OFF** to disable the *Follow-SYSTEM* mode in standalone switcher applications[3].

You **must set DIP 5 ON** to enable the *Follow-SYSTEM* mode in an interconnected varied-format switcher application[4].

Refer to section 11.2 for a description of the MENU's *Follow-SYSTEM* and *Breakaway-from- SYSTEM* modes.

8.4 Understanding the SLAVE Mode

The SLAVE mode is only used for the multi-channel video switcher configuration, for example, when joining together two units. Two units could be configured as a 16x16 s-Video (Y/C) with 4-channel stereo audio.

One unit is used as the Master, and the other unit is the Slave. The Slave always follows the Master. In the example the first unit is the Master (with DIP 6 set OFF disabling the Slave mode) and the second unit is the Slave (with DIP 6 set ON enabling the Slave mode).

On the Slave unit, the MATRIX and STATUS displays do not illuminate and the STATUS display shows this message:

Keyboard LOCKED

1 Video and the audio channels switch simultaneously in the same way

2 Audio channels switch independently from the video channels

3 See section 7.1

4 See section 7.2

However, the STATUS display on the Slave unit dynamically shows[1] all changes made from the Master unit (which are implemented also on the Slave unit).

Front panel control is via the Master unit, on which the front panel buttons are unlocked and both the MATRIX and STATUS displays illuminate.

9 Connecting a Control Interface

Connect a control interface (RS-232 or RS-485) unless operating a unit as a standalone unit without any control device (that is, with control from the front panel or IR port, and not via a remote controller or a PC).

The control interface must be identical on each switcher in the series of 16x16 matrix switchers; either RS-232 or RS-485. One control interface suffices. Do not use both RS-232 and RS-485 control interfaces in the same configuration. For example, in an interconnected varied-format 16x16 switcher application[2], if the switcher that connects to the PC connects via the RS-232 control interface, each switcher must interconnect via the RS-232 control interface and not via the RS-485 control interface.

To operate the switcher at a range of up to 25 meters with a point-to-point connection, use the RS-232 control interface.

To operate the switcher at a range of up to 1000 meters, use the RS-485 control interface.

9.1 Connecting the RS-232 Control Interface

Connect several switchers (from the series of 16x16 matrix switchers) and the control unit in an RS-232 daisy chain arrangement, with or without using a null-modem adapter, as Figure 9 illustrates.

The RS-232 daisy chain switcher arrangement is transparent. This lets you arrange the switchers (from the series of 16x16 matrix switchers) according to your requirements, and not according to a fixed sequence dependent on the MACHINE # and/or MACHINE ADDRESS #.

You can connect any of the following:

- Two units, with a null-modem adapter (see section 9.1.1) or without a null-modem adapter (see section 9.1.2)
- The 9-pin D-sub COM port of the PC to a unit with a null-modem

1 Albeit with an LCD Display that does not illuminate

2 See section 7.2

adapter (see section 9.1.3) or without a null-modem adapter (see section 9.1.4)

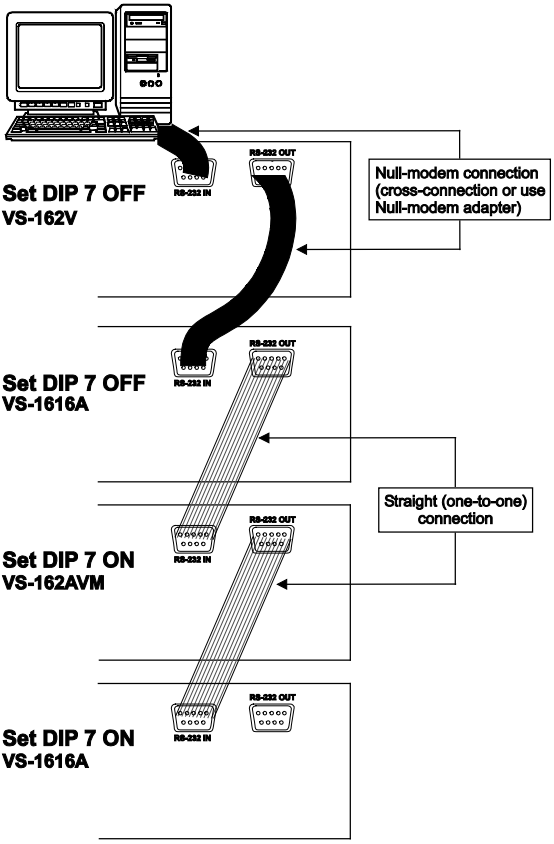


Figure 9: Connecting a PC to Four Units

9.1.1 Connecting Two Units with a Null-Modem Adapter

To connect two units, **using a null-modem adapter** provided with the machine (default):

1. Connect a flat cable[1] between the RS-232 OUT 9-pin D-sub port on the first unit and the null-modem adapter that attaches to the RS-232 IN 9-pin D-sub port on the second unit.
2. On the second unit, set **DIP 7 OFF** (enabling null-modem adapter use).

1 Straight one-to-one uncrossed connections with at least the 3 wires pins # 2, # 3 and # 5

9.1.2 Connecting Two Units without a Null-Modem Adapter

To connect two units, **without using a null-modem adapter**:

1. Connect a flat cable[1] between the RS-232 OUT 9-pin D-sub port on the first unit and the RS-232 IN 9-pin D-sub port on the second unit.
2. On the second unit, **set DIP 7 ON** (disabling null-modem adapter use[1]).

9.1.3 Connecting to a 9-pin PC COM Port with a Null-Modem Adapter

To connect the 9-pin D-sub COM port of a PC to a unit, **using a null-modem adapter**:

1. Connect a flat cable[1] between the 9-pin D-sub COM port of a PC and the null-modem adapter that attaches to the RS-232 IN 9-pin D-sub port on the unit.
2. **Set DIP 7 OFF** (enabling null-modem adapter use[1]) on the unit.

9.1.4 Connecting to a 9-pin PC COM Port without a Null-Modem Adapter

To connect the 9-pin D-sub COM port of a PC to a unit, **without using a null-modem adapter**:

1. Connect a flat cable[1] between the 9-pin D-sub COM port of a PC and the RS-232 IN 9-pin D-sub port on the unit.
2. **Set DIP 7 ON** (disabling null-modem adapter use[1]) on the unit.

9.2 Connecting the RS-485 Control Interface

Figure 10 defines the RS-485 connector PINOUT for external RS-485 control. The RS-485 connector is also used (if required) for vertical sync:

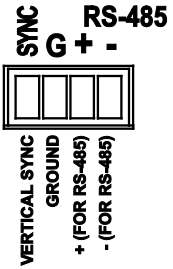


Figure 10: RS-485 Connector PINOUT

1 See section 8.1

To connect an RS-485 connector on one unit to an RS-485 connector on one or more other switchers (from the series of 16x16 matrix switchers), as Figure 11 illustrates:

1. Connect the "+" PIN on the first unit to the "+" PIN on the second unit or other unit
2. Connect the "-" PIN on the first unit to the "-" PIN on the second unit or other unit
3. If shielded cable is used for an RS-485 connection, connect the shield to the Ground PIN.

For details about how to configure the vertical sync (if required), refer to section 9.3 and Figure 17 in section 11.3.1.

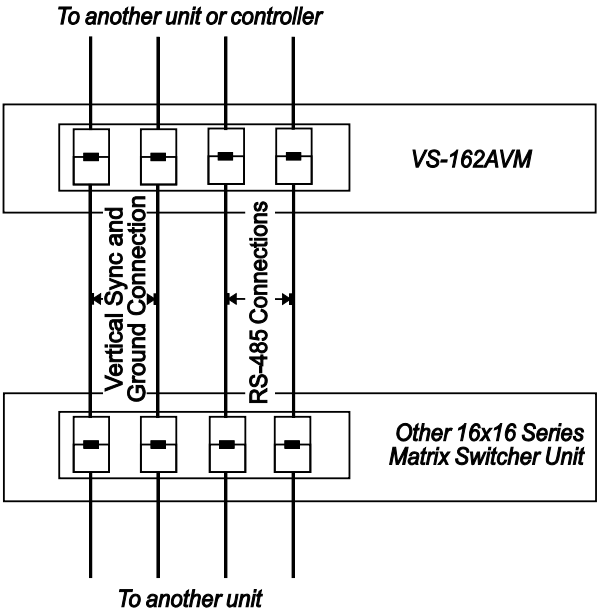


Figure 11: Connecting the RS-485 Connectors

Figure 12 illustrates the RS-485 line that connects:

- To the PC via a Kramer Tools **VP-43xl** *Interface Converter* (connect the PC's 9-pin D-sub COM port to the "RS-232 in" 9-pin D-sub (F) port on the **VP-43xl**. Next, connect the RS-485 port on the **VP-43xl** to the RS-485 ports on the unit by connecting the "A" terminal of the **VP-43xl** to the "+" terminals of the switchers, and "B" to "-" terminals)

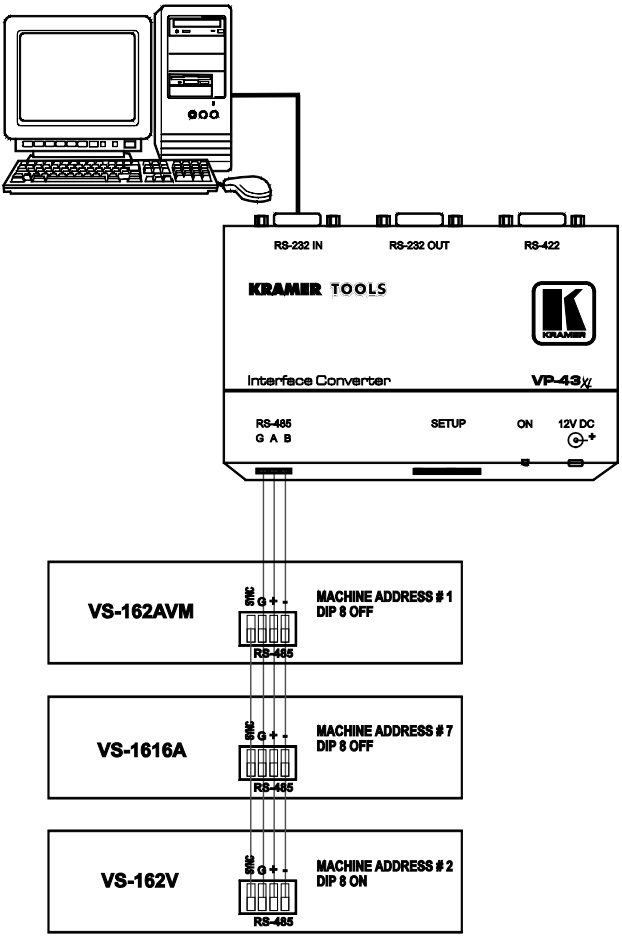


Figure 12: An RS-485 Control Interface Setup

9.3 Configuring the Sync

On the unit, you can select one of the following, as the sync input:

- EXTERNAL ("sync in" BNC connector)
- INPUT # 1 BNC connector
- MTX (Sync from Matrix) RS-485 terminal block connector, when using multiple machines[1]

1 Refer to section 11.3.1

Configure the sync via the SWITCHING METHOD Menu command setting[1]. When setting up multiple machines, linking a common sync to all the machines may be necessary to facilitate simultaneous vertical interval switching.

Usually, the easiest method is to choose the sync source from the first machine and then connect all the terminal block connectors.

In this case, set the first machine to select the sync source from the external sync connector or from the INPUT # 1 connector. This sync is now available to the other machines via the RS-485 terminal block connector, as Figure 10 and Figure 11 illustrate. Select the MTX sync on the other machines that receive that sync.

9.4 Connecting the KEYBOARD EXTENSION

Connecting the contact closure switches to the Keyboard Extension (*EXT. KEYS*) connector enables you to route an input to an output by remote control from a distance of up to 1000 meters. These IN and OUT keys are expandable[2]. Figure 13 illustrates how to connect the Keyboard Extension (*EXT. KEYS*):

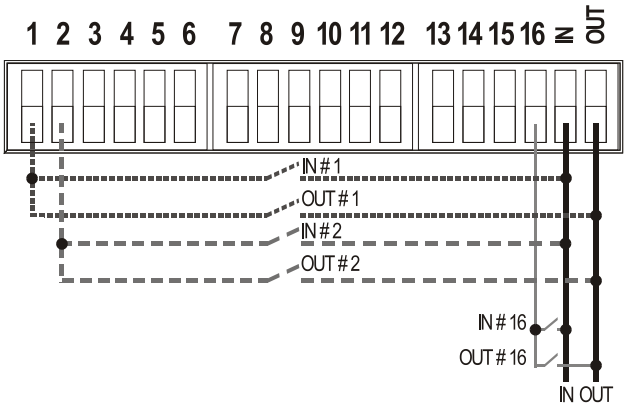


Figure 13: Keyboard Extension (EXT. KEYS) Connector

To use the Keyboard Extension, activate the extended KEYBOARD setting Menu command, as section 11.4 describes.

1 Refer to section 11.3

2 Add an unlimited number of push buttons to the existing keys (in parallel) by attaching one end of the push button to the corresponding number and the other end to the IN or OUT terminal

10 Operating Your VS-162AVM

Operate your **VS-162AVM** via:

- The front panel buttons (as this section describes)
- RS-232 or RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller (see section 14)
- Kramer **RC-IR3** Infrared Remote Control Transmitter
- Contact closure switches connected to the keyboard extension
- An external IR receiver unit for controlling the machine via an IR remote controller

10.1 Startup Display

After switching on the power, the *MATRIX* and *STATUS*[1] displays show the following screen:

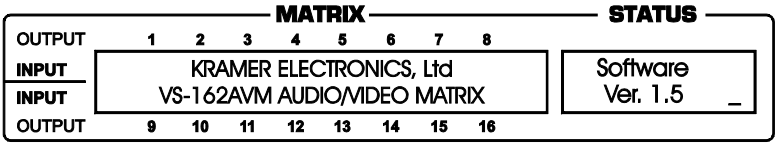


Figure 14: Default Startup Status Display Sequence

After a few seconds the MATRIX display shows the current OUT and IN connections. The contents of the STATUS display depend on the current switcher setup. To choose what to indicate on the status display, see section 11.6.

10.2 Preview Display

The preview display with its headphone output lets you see and hear the contents of any video or audio input that is currently connected to output 16.

Output 16 is also available for regular output with the same specs as all the other outputs. The regular video output and the preview display switch in parallel as well as the audio output.

The Preview/16 output is manually controlled (it does not switch automatically) and switches the same way as all the other outputs. This includes remote operations.

1 Version 1.5 is shown in the Status Display as an example; text in the matrix display may vary (according to machine settings)

Depending on environmental light conditions, the preview display can be adjusted with the small black pushbuttons on right of the display. Each press of the MENU button highlights the BRIGHTNESS, CONTRAST, SATURATION and SHARPNESS settings (see Figure 15). The "+" and "-" buttons adjust each setting. The preview display can be turned ON or OFF with the POWER pushbutton.

The display headphone volume is adjusted with the VOLUME knob.

Figure 15: Display Menu

10.3 Using the Front Panel Buttons

You can use the front panel buttons to operate the following functions:

- Switch video/audio signals in the *BREAKAWAY* or *AUDIO-FOLLOW-VIDEO* modes (see section 10.4)
- Choose the *AT ONCE* or *CONFIRM* modes (see section 10.5).

You can switch (see section 10.6) and clear (see section 10.7):

- One input to one output
- Several inputs to several outputs
- One input to all outputs

10.4 Choosing the Audio-Follow-Video or Breakaway Mode

You can switch video/audio signals in one of two ways, either BREAKAWAY or AVF.

To set the *BREAKAWAY* mode, in which video and audio channels switch independently, either:

1. Press the VIDEO (for video control only) button.
   If the VIDEO button illuminates, all operations and the LCD MATRIX and STATUS displays relate to video; **or**

2. Press the AUDIO (for audio control only) button.
   If the AUDIO button illuminates, all operations and the LCD MATRIX and STATUS displays relate to audio.

To set the *AFV* (audio-follow-video) mode[1], in which all operations relate to both the video and the audio channels[2]:

1. Press the AFV button.
2. If the audio and video configurations are the same, the AFV button illuminates. All operations and the LCD MATRIX and STATUS displays relate to both the video and the audio channels.
3. If the audio configuration differs from the video configuration, each of the following occurs simultaneously:
   - The audio and video buttons flash in a fast alternating cycle
   - The TAKE LED flashes
   - In the MATRIX display, digits that represent different audio/video configurations flashes alternately
     (For example, the MATRIX display would show as the input for output 10, the flashing, alternating digits 01 and 02, if IN 1 was routed to OUT 10 for video, and IN 2 was routed to OUT 10 for audio)
4. Press the TAKE button to confirm the modification (reconfiguring the audio according to the video).

10.5 Confirming Settings

Choose to work in the *AT ONCE* mode or the *CONFIRM* mode:

In the *AT ONCE* (default[3]) mode:

- Actions require no user confirmation
- Execution is immediate
- No protection is offered against changing an action in error

In the *CONFIRM* mode[4]:

- You have an optional method to help avoid making a mistake
- Every action requires user confirmation

1 Be aware that all audio configurations that differ from the video configurations are lost when returning to the audio breakaway mode after the AFV mode. To store an audio configuration setup, see section 10.8.1

2 Audio and video connections are the same and switch at the same moment at the beginning of the sync

3 For all actions except storing/recalling setups

4 The CONFIRM mode is the default for storing/recalling setups (see section 11.5)

- Execution is delayed[1] until the user confirms the action
- Protection is offered to prevent erroneous switching
- You can key-in several actions and then confirm them by pressing the TAKE button once, to simultaneously switch several outputs

To toggle between the AT ONCE (default) mode and the CONFIRM mode, press the TAKE button.

In CONFIRM mode: actions require user confirmation and the TAKE LED lights.

In AT ONCE mode: Actions do not require user confirmation and the TAKE LED does not light.

When the TAKE LED flashes:

- You cannot toggle between the AT ONCE and CONFIRM modes
- You can execute the previous action, by pressing the TAKE button
- You can cancel the previous action, by pressing a non-relevant button (for example, the MENU button)

10.6 Switching

You can switch:

- One input to one output (see section 10.6.1)
- Several inputs to several outputs (see section 10.6.2)
- One input to all outputs (see section 10.6.3)

10.6.1 Switching one Input to one Output

Pressing an OUT-IN combination when your unit operates in the AT ONCE mode implements the switch immediately.

To switch one input to one output (AT ONCE mode):

1. Press the appropriate OUT button.
   The MATRIX display shows the 2 flashing digits, representing the present input number connected to that specific output[2]. If the present output is clear, the 2 flashing digits *00* appear in the MATRIX display.
   The STATUS display shows the message:

   out # x

1 Failure to press the TAKE button within about 30 seconds (the Timeout) aborts the action

2 For example, pressing OUT button 9 shows the blinking digits 01 if input 1 was previously routed to OUT 9

Where x is the output number

2. Press the appropriate IN button.
   The output switches to the input and the MATRIX display shows the Input # instead of the flashing digits.
   The STATUS display momentarily shows the message:

   out # x
   from in # y

   Where x is the output number and y is the input number

Pressing an OUT-IN combination when your unit operates in the CONFIRM mode (and the TAKE LED is lit), requires user confirmation.

To switch one input to one output (CONFIRM mode):

1. Repeat step 1 above.
2. Press the appropriate IN button.
   The MATRIX display shows the 2 flashing digits, representing the input number and the TAKE LED flashes.
   The STATUS display shows[1] the message:

   out # x
   from in # y

   Where x is the output number and y is the input number
3. Press the TAKE button to confirm the action.
   The output switches to the input and the TAKE LED lights.

10.6.2 Switching Several Inputs to Several Outputs

In the *AT ONCE* mode, you need to execute each OUT-IN combination separately (see section 10.6.1). When switching many inputs to many outputs it is recommended to toggle to the CONFIRM mode.

In the CONFIRM mode you can key-in several actions and then confirm them by pressing the TAKE button once (simultaneously switching several inputs to several outputs).

To switch several inputs to several outputs in the CONFIRM mode (the TAKE LED is lit), do the following:

1. Press the appropriate OUT button.
   The MATRIX display shows the 2 flashing digits, representing the previous input number for that specific output[2]. If the previous input is clear, the 2

1 Continuously, within the limit of the timeout (approximately 30 seconds)

2 For example, pressing OUT button 9 shows the blinking digits 01 if input 1 was previously routed to OUT 9

flashing digits *00* appear in the MATRIX display.
The STATUS display shows the message:

out # x

Where x is the output number

2. Press the appropriate IN button.
   The MATRIX display shows the 2 flashing digits, representing the input number and the TAKE LED flashes.
   The STATUS display shows[1] the message:

   out # x
   from in # y

   Where x is the output number and y is the input number
3. Press the second appropriate OUT button, repeating step 1 above.
4. Press the appropriate[2] IN button, repeating step 2 above.
5. Continue with this OUT-IN button sequence, pressing the appropriate OUT and IN buttons, as required. You can also combine an OUT-OFF or OFF-OUT combination with this sequence.
6. After completing the sequence, press the TAKE button to confirm the actions.
   The inputs switch to the respective outputs, as the MATRIX display shows (no digits flash) and the TAKE LED lights.

10.6.3 Switching One Input to All Outputs

To switch one input to all the outputs (in the AT ONCE mode):

1. Press the ALL button.
   The MATRIX display shows all the sets of 2 flashing digits (each representing the present input number for that respective output) flashing simultaneously.
   The STATUS display shows the message:

   all OUTs
2. Press the appropriate IN button.
   This input switches to all the outputs and the MATRIX display shows the identical non-flashing 2 digits (representing that input number).

To switch one input to all the outputs (in the CONFIRM mode, (the TAKE LED is lit)):

1 Continuously, within the limit of the timeout (approximately 30 seconds)

2 That corresponds with the second OUT button

1. Repeat steps 1 and 2 above.
   The TAKE LED flashes.
2. Press the TAKE button to confirm the action.
   The selected input switches to all the outputs and the TAKE LED lights.
   The MATRIX display shows the identical 2 non-flashing digits (representing that input number) for all outputs.

10.7 Clearing[1]

You can clear (delete):

- One output (see section 10.7.1)
- Several outputs (see section 10.7.2)
- All outputs (see section 10.7.3)

10.7.1 Clearing an Output

To clear an output (in the AT ONCE mode):

1. Press the appropriate OUT button.
   The MATRIX display shows the 2 flashing digits, representing the present input number for that specific output[2]. If the present input is clear, the 2 flashing digits *00* appear in the MATRIX display.
   The STATUS display shows the message:

   out # x

   Where x is the output number
2. Press the OFF button[3].
   The input is cleared and the MATRIX display does not show any Input # in its place.
   The STATUS display momentarily shows the message:

   out # x
   reset

   Where x is the output number

To clear an output (in the CONFIRM mode (the TAKE LED is lit)):

1. Repeat step 1 above.
2. Press the OFF button[3].
   The MATRIX display shows the 2 flashing digits *00* instead of the previous

1 "Clearing" means disconnecting the output from any of the inputs, and leaving it disconnected

2 For example, pressing OUT button 9 shows the blinking digits 01 if input 1 was previously routed to OUT 9

3 You can press the OFF button first, and then an OUT button (the order is irrelevant)

2 flashing digits and the TAKE LED flashes.
The STATUS display shows[1] the message:

out # x
reset

Where x is the output number

3. Press the TAKE button to confirm the action.
The input is cleared and the TAKE LED lights. The MATRIX display does not show any Input # in its place.

10.7.2 Clearing Several Outputs

To clear several outputs (in the AT ONCE mode):

1. Press the appropriate OUT button.
The MATRIX display shows the 2 flashing digits, representing the present input number for that specific output[2]. If the present output is clear, the 2 flashing digits *00* appear in the MATRIX display.
The STATUS display shows the message:

out # x

Where x is the output number

2. Press the OFF button.
The output is cleared and the MATRIX display does not show any Input # in its place.
The STATUS display momentarily shows the message:

out # x
reset

Where x is the output number

To clear several outputs (in the CONFIRM mode (the TAKE LED is lit)):

1. Repeat step 1 above.
2. Press the OFF button.
The MATRIX display shows the 2 flashing digits *00* instead of the previous 2 flashing digits and the TAKE LED flashes.
The STATUS display shows[1] the message:

out # x
reset

1 Continuously, within the limit of the timeout (approximately 30 seconds)

2 For example, pressing OUT button 9 shows the blinking digits 01 if input 1 was previously routed to OUT 9

Where x is the output number

3. Press the second appropriate OUT button, by repeating step 1 above.
4. Repeat step 2 above.
5. Continue with this OUT-OFF button sequence, pressing the appropriate OUT buttons and the OFF, as required.
   The MATRIX display shows the sets of 2 flashing digits, representing the present input number for each specific output.
6. After completing the sequence, press the TAKE button to confirm the actions.
   The inputs are cleared and the TAKE LED lights. The MATRIX display does not show any Input # in its place.

10.7.3 Clearing All Outputs

To clear all outputs (in the AT ONCE mode):

1. Press the ALL button.
   The MATRIX display shows all the sets of 2 flashing digits (each representing the present input number connected to that respective output) flashing simultaneously.
   The STATUS display shows the message:

   all OUTs

2. Press the OFF button[1].
   All the outputs are cleared and the MATRIX display momentarily shows the message:

   Reset ALL connections
   !!!!

To switch one input to all the outputs (in the CONFIRM mode, the TAKE LED is lit):

1. Repeat step 1 above.
2. Press the OFF button[1].
   The TAKE LED flashes and the MATRIX display shows the message:

   Reset ALL ?
   Press TAKE to execute

3. Press the TAKE button to confirm.
   All the outputs are cleared and the TAKE LED lights.

1 You can press the OFF button first, and then the ALL button (the order is irrelevant)

10.8 Storing and Recalling Setups

You can store up to 60 settings in the non-volatile memory with the ability to recall each of those settings. Whenever a setup is stored (and in whatever mode), the following information is saved as an integral part of that stored setup:

- Video status
- Audio status
- Mode (AUDIO-FOLLOW-VIDEO or BREAKAWAY)

10.8.1 Storing Setups

To store a setting, do the following:

1. Press the STO button.
   The displays show the messages:

Enter SETUP number	**Store**
use two digit # 01-60	**# xy**

   Where xy are the OUT buttons.
2. Press two OUT buttons, using the OUTkeys # 1 to 9, and 10 (for 0).
   The OUTkeys function on a decimal-basis, and not on a positional-basis. For example, to enter the # 14, press # 1 followed by # 4 (not # 14). To enter the # 3, press # 3 followed by the TAKE button[1].
   The setups shown in the displays flash. In addition, the TAKE LED and the appropriate mode button[2] also flash.
   The displays show the messages:

STORE this SETUP ?	**Store**
YES -> TAKE	**# xy**

3. Press the *TAKE* button.
   The memory stores the setup and the MATRIX display shows the message:

   Setup # xy stored

Note, saving a setup to a pre-allocated setup #, prompts the message in the MATRIX display:

Setup already exists
Press TAKE to overwrite

Pressing the TAKE button replaces the stored setup with the current setup. Alternatively, press a different OUT button to change the setup #.

1 Alternatively, pressing # 10 followed by # 3 also enters the # 3

2 VIDEO, AUDIO or AFV

10.8.2 Recalling Setups

To recall a setting, do the following:

1. Press the *RCL* button.
   The displays show the messages:

Enter SETUP number	**RECALL**
use two digit # 01-60	**# xy**

   Where xy are the OUT buttons.

2. Press the appropriate two OUT buttons, using the OUTkeys # 1 to 9, and 10 (for 0). The OUTkeys function on a decimal-basis, and not on a positional-basis. For example, to enter the # 14, press # 1 followed by # 4 (not # 14). To enter the # 3, press # 3 followed by the TAKE button[1].
   The memory recalls the setup. The MATRIX display shows the flashing setup, and the TAKE LED as well as the appropriate mode button[2] flashes. The STATUS display shows the message:

   RECALL
   # xy

   Where xy are the OUT buttons.

3. Preview the setup to decide if to implement it, by pressing the:

- VIDEO or the AUDIO button, for video or audio setups in the *BREAKAWAY* mode. Pressing the AFV button has no effect if setups are stored in the *BREAKAWAY* mode
- AFV button, for setups in the *AUDIO-FOLLOW-VIDEO* mode. Pressing the VIDEO or the AUDIO button has no effect if setups are stored in the *AUDIO-FOLLOW-VIDEO* mode

  If you decide not to implement the setup, you can scan the other setups, by pressing different OUT buttons. To stop previewing the setups, press a non-relevant button, for example, an IN button.

4. Press the TAKE button.
   The specific setup is implemented.

If trying to recall an empty setup[3], the MATRIX display would show a message saying that that particular setup is empty and would return you to step 1 above.

1 Alternatively, pressing # 10 followed by # 3 also enters the # 3

2 VIDEO, AUDIO or AFV

3 That is, a setup # for which no setup is actually stored

11 MENU Commands

You can press the MENU button up to 11 times in straight sequence to scan the range of commands.

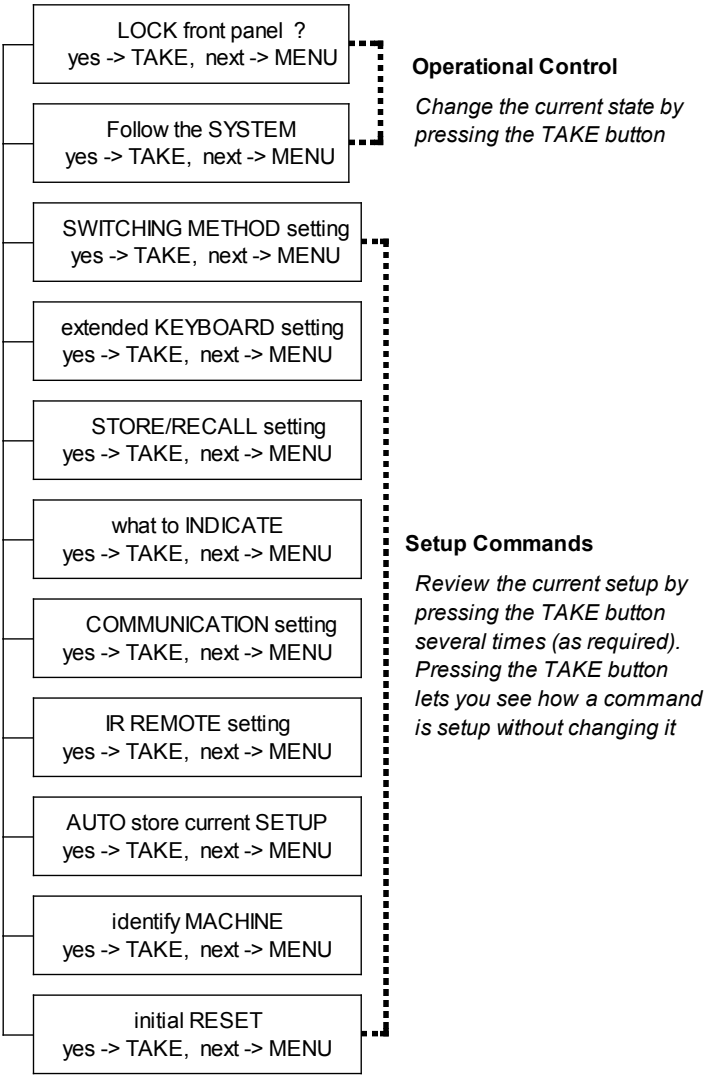

LOCK front panel ?
yes -> TAKE, next -> MENU
Follow the SYSTEM
yes -> TAKE, next -> MENU
Operational Control
Change the current state by pressing the TAKE button
SWITCHING METHOD setting
yes -> TAKE, next -> MENU
extended KEYBOARD setting
yes -> TAKE, next -> MENU
STORE/RECALL setting
yes -> TAKE, next -> MENU
what to INDICATE
yes -> TAKE, next -> MENU
COMMUNICATION setting
yes -> TAKE, next -> MENU
IR REMOTE setting
yes -> TAKE, next -> MENU
AUTO store current SETUP
yes -> TAKE, next -> MENU
identify MACHINE
yes -> TAKE, next -> MENU
initial RESET
yes -> TAKE, next -> MENU
Setup Commands
Review the current setup by pressing the TAKE button several times (as required). Pressing the TAKE button lets you see how a command is setup without changing it

Figure 16: Sequence of MENU Commands

You can stop changing a setup at any time by pressing any IN button.

11.1 Locking and Unlocking the Front Panel

To prevent changing the settings accidentally or tampering with the unit via the front panel buttons, lock[1] your unit. Unlocking releases the protection mechanism.

To lock the unit:

1. Press the MENU button once.
   The MATRIX display shows the message:

   LOCK front panel?
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The front panel locks and the displays momentarily show the messages:

   Front panel LOCKED
   to unlock- press MENU[2]

   Keyboard LOCKED[3]

   Pressing a front panel button has no effect[4] but remote RS-232 and RS-485 commands function and show on the MATRIX display.

To unlock the **VS-162AVM**:

Either:

1. Press the MENU button.
   The MATRIX display shows the message:

   to UNLOCK front panel
   press TAKE

   The *TAKE* LED flashes.

2. Press the *TAKE* button.
   The front panel unlocks[5] and the MATRIX display momentarily[2] shows the message:

   Front panel
   UNLOCKED

Or:

1 Nevertheless, even though the front panel is locked you can still operate via RS-232 or RS-485 serial (remote controller or PC)

2 After a few seconds, the status of the unit replaces this message

3 This message appears continuously in the STATUS display, until the front panel is unlocked

4 IR and Keyboard Extension (EXT. KEYS) commands are also blocked

5 Switching the power off and on again also unlocks the front panel

1. Press the *TAKE* button twice.
   The front panel unlocks and the same messages show as in steps 1 and 2 above.

11.2 Choosing the Follow or Breakaway Mode

The terms *audio-follow-video*[1] and *audio breakaway*[2] are well known. Sometimes signals other than audio signals need to switch simultaneously and at other times, need to switch independently. For example:

- Non-linear editing systems, that sometimes combine video with analog audio and at other times combine video with digital audio
- Duplication systems, that make Master tapes from programs with different formats: composite analog, component analog and component digital

When the Follow-SYSTEM command is selected, the unit automatically switches in the AUDIO-FOLLOW-VIDEO (AFV) mode and the AFV button illuminates.

When the BREAKAWAY from video command is selected (the Video or the Audio button illuminates), the unit automatically switches in the Breakaway-From-SYSTEM mode.

When the unit functions in the:

- *Follow-SYSTEM* mode, the unit switches with other 16x16 matrix switchers[3], implementing the same action simultaneously
- *Breakaway-from-SYSTEM* mode, the unit[4] functions independently, implementing an action independently of the others

The unit functions[5] in the *Follow-SYSTEM* mode if at least one other unit[6] is set to the *Follow-SYSTEM* mode and these units interconnect via an RS-232 and/or RS-485 communication line.

To set the unit to function in the *Follow SYSTEM* mode:

1 Video and the audio channels switch simultaneously in the same way

2 Audio channels switch independently from the video channels

3 16x16 matrix switchers in the same series that include, for example, the VS-1616A (a 16x16 analog balanced stereo audio matrix switcher) units and/or the VS-162V (a 16x16 video matrix switcher)

4 Also applies to a VS-1616A unit

5 The unit changes its status immediately and goes to the Follow-system mode

6 Or VS-1616A unit (as well as other 16x16 matrix switchers in the same series)

1. Press the MENU button twice.
   The MATRIX display shows the message:

   Follow the SYSTEM
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

   set UNIT follow SYSTEM? **current:**
   Press TAKE to execute **breakaway**

3. Press the *TAKE* button again.
   The MATRIX display momentarily shows this message, followed by the status of the switcher and in the STATUS display the letter "S" is displayed behind the flashing cursor:

   the UNIT is set in mode
   FOLLOW system

   If the status of the unit differs from that of the other unit(s), set the unit to the *Follow-SYSTEM* mode. The MATRIX display flashes the new status of the switcher and the TAKE LED flashes. Pressing the *TAKE* button[1] implements all the changes to the same state as the rest of the system placing the switcher in the *Follow-SYSTEM* mode.

To set the unit to function in the *Breakaway-from-SYSTEM* mode:

1. Press the MENU button twice.
   The MATRIX display shows the message:

   FOLLOW the system
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

   BREAKAWAY from system? **current:**
   Press TAKE to execute **follow SYS**

3. Press the *TAKE* button again.
   The MATRIX display shows the message:

   the UNIT is set in mode
   BREAKAWAY from system

1 Pressing a different button cancels the operation and the switcher remains in its previous state

11.3 Choosing the SWITCHING METHOD Setting

Section 11.3.1 describes the SWITCHING METHOD settings for standalone units and large matrices. Section 11.3.2 describes how to configure a SWITCHING METHOD.

11.3.1 Understanding the SWITCHING METHOD Settings

Setting the unit as a Stand-Alone UNIT provides a choice of three SWITCHING METHOD settings:

- **NoVIS** - switching occurs immediately after completion of front panel or dry-contact operation or immediately after receiving an RS-232 or RS-485 command, or an IR command. The switching is independent of the vertical reference
- **EXT** (external sync) - switching occurs during the vertical interval of the video reference signal connected to the IN SYNC[1] connector (this signal should be properly terminated via the TERM button[2])
- **INT# 1** (internal sync) - switching occurs during the vertical interval of the video reference signal connected to IN # 1

Setting the unit as a Large Matrix (instead of as a Stand-Alone UNIT) provides a choice of 4 SWITCHING METHOD settings:

- **NoVIS**, **EXT** or **INT# 1** (as described above)
- **MTX** (SYNC from Matrix) - the vertical interval of the video reference (selected on one unit in the Large Matrix system) is present on the "SYNC" RS-485 terminal block connector[3]. This reference signal applies to all switchers in the multi-switcher system and facilitates switching all **VS-162/VS-1616** series units simultaneously

To choose the MTX (SYNC from Matrix) setting[4] as the example in Figure 17 illustrates:

- Connect the RS-485 terminal block connectors[5] between each switcher in the multi-switcher system
- Connect and set the video reference signal on one of the video units to EXT (external sync) or INT# 1 (internal sync)

1 Item 1 in Figure 1

2 Item 3 in Figure 1

3 Item 5 in Figure 1

4 This sets the matrix sync configuration from another (Master) machine

5 Via a straight connection of all 4 PINS

- Set the video reference on the other video units to the MTX (SYNC from Matrix) setting

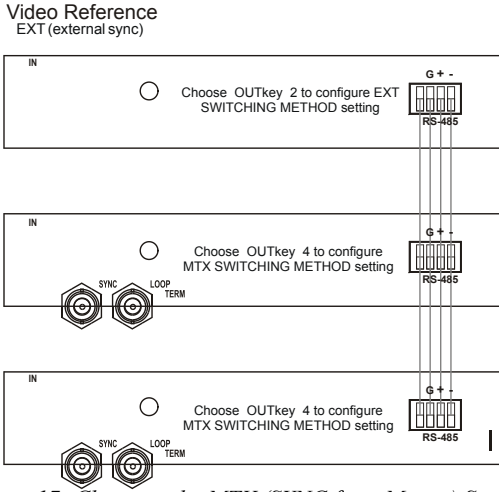


Figure 17: Choosing the MTX (SYNC from Matrix) Setting

11.3.2 Configuring a SWITCHING METHOD

To choose a SWITCHING METHOD setting, do the following:

1. Press the MENU button until you reach the SWITCHING METHOD setting.
   The MATRIX display shows the message:

   SWITCHING METHOD setting
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

Use OUTkey to configure	**Current**
1: noVIS 2: EXT 3: INT#1 4:MTX	**External**[1]

3. Press an *OUT* button from *1*, *2*, *3* or *4*. For example, *OUT* button # 3 to set the internal sync configuration.
   The *TAKE* LED flashes and the MATRIX display shows the message:

   Press TAKE to configure
   from INTERNAL (Input #1)

4. Press the *TAKE* button.
   The displays show the messages:

1 Indicating that the machine is currently set to the external switching method setting

SWITCHING METHOD changed	**current: From In #1**

11.4 Choosing the Extended Keyboard Setting

Section 9.4 describes how to connect a remote keyboard. Activate or deactivate it by setting the extended Keyboard setting ON or OFF.

To set the extended KEYBOARD mode, do the following:

1. Press the MENU button until reaching the extended Keyboard setting. The MATRIX display shows the message:

   Extended KEYBOARD setting
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

Outkey 1: External keys OFF 2: External keys ON	**current: X-key ON**[1]

3. Press the *OUT* button *1* to deactivate the External keys.
   The TAKE LED flashes and the displays show the messages:

Turn OFF external keys? Press TAKE to execute	**current: X-key ON**

4. Press the *TAKE* button.
   The displays show the messages:

External Keyboard mode changed	**current: X-key OFF**

11.5 Setting the STORE/RECALL KEYBOARD Mode

Choose one of these STORE/RECALL KEYBOARD modes:

- At ONCE mode in which setups are stored/recalled immediately without the need for user confirmation
- CONFIRM mode in which storing/recalling setups require user confirmation. The CONFIRM mode is the default[2] for storing/recalling setups and is recommended to prevent erroneously storing/recalling of setups

1 Indicating that the external keys are currently activated

2 The AT ONCE mode is the default for all actions except storing/recalling setups

To set the STORE/RECALL KEYBOARD mode to the AT ONCE mode, instead of the CONFIRM (default) mode, do the following:

1. Press the MENU button until reaching the STORE/RECALL setting. The MATRIX display shows the message:

   STORE/RECALL setting
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button and choose the appropriate Outkey 1 for the AT ONCE mode (Outkey 2 is for the CONFIRM mode). The displays show the messages:

   STO/RCL mode changed **current: At once**

11.6 Choosing What to INDICATE

Choose what is displayed during regular operation: between scrolling the switcher setup as Figure 18 illustrates, and showing the AUDIO mode.

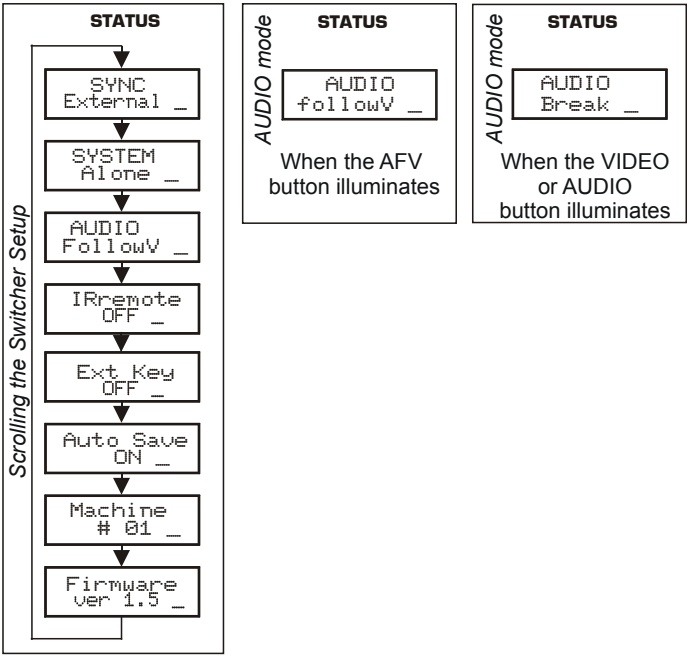


Figure 18: Choosing what to INDICATE

To scroll the switcher setup (instead of showing the AUDIO mode), do the following:

1. Press the MENU button until you reach the "What to INDICATE" command.
   The MATRIX display shows the message:

   what to INDICATE
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

Use OUTkey to configure	**Current:**
1: scroll SETUP 2: AUDIO mode	**AUDIO**

3. Press the *OUT* button *1*.
   The TAKE LED flashes and the displays show the messages:

Scroll switcher setup?	**Current:**
Press TAKE to execute	**AUDIO**

4. Press the *TAKE* button.
   The displays show the messages:

display mode	**Current:**
changed	**SETUP**

11.7 Choosing the COMMUNICATION Setting

Choose the response option (reply or no reply).

To choose the No Reply response option, for example, do the following:

1. Press the MENU button until you reach the COMMUNICATION setting.
   The MATRIX display shows the message:

   COMMUNICATION setting
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The MATRIX display shows the message:

   Use OUTkey to configure
   1: REPLY 2: No Reply

3. Press the *OUT* button *2*.
   The TAKE LED flashes and the displays show the messages:

Set serial port NO reply	**Current:**
Press TAKE to execute	**Reply**

4. Press the *TAKE* button again.
   The displays show the messages:

SWITCHER RESPONSE	**Current:**
changed	**No reply**

11.8 Setting the IR REMOTE Control

Set the IR REMOTE control to enable remote control of the *16x16 Audio-Video Router with Preview Monitor*, using the Kramer *Infrared Remote Control Device*[1]. Refer to the *Infrared Remote Control Device* user manual[2], for full details.

To set the MACHINE#, press keys # + 1. This sets MACHINE#1.

To enable IR REMOTE control (when set OFF), do the following:

1. Press the MENU button until reaching the IR REMOTE setting.
   The MATRIX display shows the message:

   IR REMOTE setting
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

   Outkey 1: InfraredREMOTE OFF
   2: InfraredREMOTE ON

   current:
   remote OFF

3. Press the *OUT* button *2*.
   The TAKE LED flashes and the displays show the messages:

   Turn ON infrared REMOTE ?
   Press TAKE to execute

   Current:
   remote OFF

4. Press the *TAKE* button again.
   The displays show the messages:

   Infrared REMOTE mode changed

   Current:
   remote ON

11.9 Choosing the AUTO STORE Current SETUP

Choose whether or not to save the current setup automatically, that is, whether to save the machine's status on power down, so that it returns to the same status after cycling power.

To save the current setup automatically (when set OFF), do the following:

1 After enabling the IR REMOTE control command, remotely control the unit via the RC-IR3 remote control transmitter pointed at the remote receiver on the machine's front panel (item 1 in Figure 1)

2 You can download the RC-IR3 user manual at http://www.kramerelectronics.com

1. Press the MENU button until you reach the AUTO Store Current SETUP command.
   The MATRIX display shows the message:

   AUTO store current SETUP
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The displays show the messages:

OUTkey 1: no AutoSave	**current:**
2: AutoSave CURRENT setup	**NO save**

3. Press the *OUT* button *2*.
   The TAKE LED flashes and the displays show the messages:

Auto store CURRENT setup ?	**Current:**
Press TAKE to execute	**NO save**

4. Press the *TAKE* button again.
   The displays show the messages:

AUTOSAVE mode	**Current:**
changed	**AutoSave**

11.10 Identifying the MACHINE

Display essential information (the product name and version number) to identify your machine, for example, for technical support purposes.

To identify your machine, do the following:

1. Press the MENU button until you reach the Identifying the MACHINE command.
   The MATRIX display shows the message:

   identify MACHINE
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The MATRIX display (as Figure 19 illustrates) shows the message:

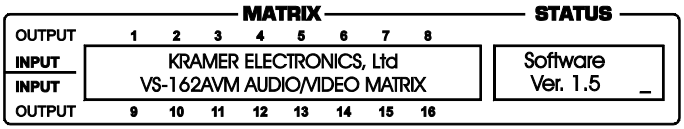


Figure 19: Machine Identification

11.11 Choosing the Initial RESET

Choose to reset the machine[1] to the:

- Current status[2] (reloads the current setup)
- Factory default (resets to the pre-installed factory default state[3])

Each **VS-162AVM** unit ships in its factory default

To reset the machine, do the following:

1. Press the MENU button until you reach the initial RESET command.
   The MATRIX display shows the message:

   initial RESET
   yes -> TAKE, next -> MENU

2. Press the *TAKE* button.
   The MATRIX display shows the message:

   Outkey 1: Current status
   2: Factory default

3. Press the *OUT* button *2*, for example, to reset to the factory default.
   The TAKE LED flashes and the displays show the messages:

   Reset to factory default **WARNING!!!!!**
   Press TAKE to execute

4. Press the *TAKE* button again.
   The displays show the messages:

   Reset to factory default **WARNING!!!!!**
   confirm by pressing OUT # 7

5. Press the *OUT # 7*.
   The machine resets to the factory default and the displays show the first messages of the reloading progress (as Figure 19 illustrates).

1 Without having to switch the power off and on

2 Sometimes called a "soft reset"

3 Each unit ships in its factory default state that is a 16x16 audio-video matrix, with all setups empty and each input connected to its corresponding output (for example, 1-to-1)

12 Flash Memory Upgrade

The main part of the unit firmware is located in FLASH[1] memory, which lets you upgrade to the latest Kramer firmware version in minutes!

Download the up-to-date file from the Internet or obtain it from your dealer. The following example shows how to install a file named (for example) "162-15.hex" to the FLASH memory[2].

The current unit software version shows in the *STATUS* display as Figure 14 illustrates in section 10.1.

12.1 Connecting the PC to the RS-232 Port

Before installing the latest Kramer firmware version on a unit, connect:

- The COM port on your PC to the RS-232 IN port on the unit

When simultaneously upgrading the firmware on several units:

- Connect the COM port on your PC to the RS-232 IN port on the first unit
- Connect the RS-232 OUT port on the first unit to the RS-232 IN port on the second unit or another 16x16 unit
- Connect all 16x16 units that you want to upgrade, in this way, linking them in a daisy chain connection
- Set DIP 7 according to whether or not a null-modem connection is being used[3]

12.2 Upgrading the Firmware

1. Install and run the *K-Sender* program on your PC.
2. Open the *K-Sender* program.
   The File COM Port Sender window opens.
3. Choose the appropriate COM port.
   Be sure that "9600 Baud rate" is chosen.
   Click the *File* button.
4. Locate the file "162-15.hex" and click the *Open* button.
   The filename appears in the lower part of the window (in bold script).

1 Electrically programmable and erasable

2 The number "15" in the file name indicates the version number "1.5". Be sure you receive the latest version, and that it is a ".hex" file

3 Refer to section 8.1 for full details

5. Press and **hold** the *TAKE* button while simultaneously turning on the *POWER* switch on the unit.
   After a few seconds, following the initial machine identification message, the MATRIX display shows the following message:

   Please,
   release key TAKE

6. Release the *TAKE* button.
   The TAKE LED flashes and the MATRIX display shows the following message:

   Update program?
   Please confirm < TAKE >

7. Press the *TAKE* button.
   The MATRIX display shows the following message:

   YOU will lose current SETUP[1]
   Confirm < TAKE >

8. Press the *TAKE* button again.
   The MATRIX display shows the following message:

   Are you ABSOLUTELY sure?
   Press TAKE to execute

   At this stage, and at any time previously, you can cancel the operation by pressing any button, other than the TAKE button.

9. Press the *TAKE* button once again.
   The program starts working and the TAKE LED turns off.
   The MATRIX display shows the following message:

   ERASE flash MEMORY
   Please, wait…

10. After a few seconds the FLASH memory is erased and the MATRIX display shows the following message:

    Ready for receiving
    Start transmission from PC

    Note: If upgrading the firmware on more than one unit, be sure to perform the above steps, 5 to 9, on each unit before continuing.

11. From your PC's *K-Sender* program, click the *Send* button.
    The color of the *Send* button changes to red and numbers appear

1 Upgrading firmware resets your unit to the factory default. This includes erasing all setups

dynamically inside the blue line. The displays on the unit show the messages:

Transfer may take minutes	**Σ=080756**[1]
Please, wait…	

12. Observe the PC monitor and the unit *MATRIX* and *STATUS display*s. After about 30 seconds, the program installation completes, the color of the *Send* button ceases to be red and the numbers inside the blue line disappear. The displays on the unit show the messages:

Program replaced	**Σ=16608D**
successfully!	**16608D**

13. After about 3 seconds, the displays show the messages:

Turn unit OFF, reconnect	**Σ=16608D**
cables and turn ON	**16608D**

14. **Verify that the checksum (for example, Σ=16608D) is the same on both lines**.
    If not, repeat the firmware upgrade process from the beginning.
15. You have successfully replaced the previous program and upgraded to the latest Kramer firmware version.
    Turn the *POWER* switch on the unit off.
    Reconnect the RS-232 IN and RS-232 OUT rear panel port connections (as applicable).
    Turn the *POWER* switch on the unit on again.
    Observe the new version number that shows in the *STATUS display*.
    Go to the Menu and restore your specific settings. Prepare and store all necessary setups.

1 Shows the dynamic progress upgrade of the checksum

13 Technical Specifications

Table 6 includes the technical specifications:

Table 6: Technical Specifications[1] of VS-162AVM

INPUTS:	Video: 16 composite video 1 Vpp/75Ω on BNC connectors Audio: 16 balanced audio 10kΩ on detachable terminal block connectors
OUTPUTS:	Video: 16 composite video 1 Vpp/75Ω on BNC connectors Audio: 16 balanced audio 50Ω on detachable terminal block connectors
MAX. OUTPUT LEVEL:	Video: 2.2 Vpp; Audio: 20dBm
BANDWIDTH (-3dB):	Video: 90 MHz; Audio: >100 kHz
DIFF. GAIN:	<0.18%
DIFF. PHASE:	± 0.4 Deg.
K-FACTOR:	<0.05%
S/N RATIO:	Video: 76dB; Audio: 82dB, unweighted
CROSSTALK (all hostile):	Video: <-46dB @ 5MHz; Audio: -80dB @ 1kHz
CONTROLS:	41 selector switches; RS-232, RS-485, IR remote, dry keyboard extension, 3.5" LCD preview display, 1/4" headphone output with volume dial
COUPLING:	Video: DC; Audio: AC
AUDIO THD + NOISE:	0.04% @ 1kHz
AUDIO 2nd HARMONIC:	0.002%
POWER:	100-240V AC, 50/ 60Hz, Imax=400mA, 31VA
DIMENSIONS:	19" x 7" x 2U W, D, H rack-mountable
WEIGHT:	3.7 kg (8.2 lbs) approx.
ACCESSORIES:	Power cord, null-modem adapter, Windows®-based Kramer control software, rack "ears"

14 Communication Protocol

Table 7 lists the Protocol *2000*[2] hexadecimal codes[3]. The communication parameters are: 9600 baud, with no parity, 8 data bits and 1 stop bit.

1 Specifications are subject to change without notice

2 Full details are available on our Web site: www.kramerelectronics.com

3 This example assumes MACHINE # 1, and node 0

Table 7: Hex Table for the VS-162AVM

	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7	OUT 8	OUT 9	OUT 10	OUT 11	OUT 12	OUT 13	OUT 14	OUT 15	OUT 16
IN 1	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 2	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 3	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 4	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 5	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 6	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 7	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 8	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 9	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 10	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 11	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 12	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 13	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 14	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 15	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 16	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01
	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

  * FCC and CE approved using STP cable (for twisted pair products)

For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found.
We welcome your questions, comments and feedback.

Safety Warning:
Disconnect the unit from the power supply before opening/servicing.

Kramer Electronics, Ltd.
Web site: www.kramerelectronics.com
E-mail: info@kramerel.com
P/N: 2900-000629 REV 2